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PERCEPTION OF WATER USERS TO HEALTH IMPACTS: IMPLICATIONS FOR URBAN SELF SUPPLY WATER SAFETY PLANS

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ABSTRACT

Water safety plans were introduced ten years ago in international guidance documents. The plans have been extensively applied across developed and developing countries and for rural and urban water supply systems. The adoption and development of the same for self supply systems is, however, long coming. Like any intervention, water safety plans require respectively, adoption, development, and implementation. Water safety policy will be ineffective and technically useless without adoption. Adoption is linked with perception and attitude of water users, who in the context of self supply systems, are also the asset (source) owners, the water supplier, and invariably, the adopters. This paper investigates water user's insight to health impact in Abeokuta, Nigeria. The study is premised within a wider research, in which a total of 105 interviews were conducted between 2007 and 2008, towards appropriate water safety plans for self supply systems. The interviews were semi-structured with open ended questions. 61 one respondents were interviewed on health related matters. Details of the raw data were subsequently coded. Findings revealed a general denial attitude to health related impact and five main factors that modulate the identified stance. The paper discusses how the factors combine to shape perception to health impacts and examine the implications on water safety planning for particularly self supply systems.

Keywords: Health impacts, self supply systems, water safety plans, perceptions, water users

INTRODUCTION

Water users have long been recognized as an important actors in water management and their perception may very well be more important than reality, especially when it comes to the quality of drinking water (Sheat, 1992). It is also increasingly noticed that water quality standards, since the introduction of water safety plans in guidance documents, are based on the protection of human health and consumer acceptability (WHO, 2004; 2011; IWA, 2004). Ignoring consumer perspectives due to difficulty of perception integration into sustainable interventions can lead to public censure and implementation problems. On the other hand,

understanding of the factors that influence consumer (water user) perception to health related impacts derived from their water sources can contribute to improvements in water management and facilitate better adoption of water safety measures.

The concept of self supply systems is known, common and widely practiced throughout the world, the potential for self supply sources in Sub-Saharan Africa is, however, huge (Sutton, 2007). Sutton (2007) particularly noted that more than a million people per country in the region depend on self supply sources. More than 23 million people take water from same sources in Nigeria, thereby making Nigeria the country with the highest number of self supply systems in the region (Sutton, 2004). Studies on water user perception on health impact from available water sources with implications for water safety plans adoption and implementation is not readily available in literature relative to perception on water quality (Strang, 2001; Doria *et al*., 2005). In addition, many of the existing perception studies are researched in developed countries where generally the sources are reliable, and water quality and safety standards highly regulated. As a result, current knowledge as noted by Doria (2010) may be geographically biased and extrapolations to developing countries may be grossly inappropriate.

This paper thus investigates water user's insight to health impact in Abeokuta, Nigeria. It discusses the main factors that influence perceptions, and concludes by examining the various implications for water safety planning. It aims to foster rapid adoption and implementation of water safety management of especially self supply systems.

MATERIALS AND METHODS

This study is premised within a wider research, in which a total of 105 interviews were conducted between March and July 2007, and July to August 2008, towards appropriate water safety plans for self supply systems. The purpose of the qualitative aspect is to assess in part, owners/users' perceptions of water quality, source and water safety, and safety interventions. Robson (2002) advised '*To find out what people do in public, use direct observation…what they think, feel and/or believe, use interviews, questionnaires or attitude scales..'*. This rule of thumb was applied. The interviews were semi-structured with open ended questions. 61 of the 105 respondents provided insight on health related matters. Transcripts of interviews were made from the original taped conversations. Taped conversations were played back for transcription. Interviews made in vernacular were first translated, hand written and typed. Translation, however, aimed for clear rather than verbatim transcripts. Grammatical corrections were made where necessary for further clarity without changing or influencing the meaning. Details of the raw data were subsequently coded.

Coding is an essential analytical process in qualitative research. The importance is to free the author from entanglement in the details of the raw data, and encourages higher level thinking about them (Neuman, 2003; Richards, 2006). The coding analysis was guided by the study objectives and oriented towards the water safety plans framework. Coding of the interview data was done manually using the colour coding analysis. Interview responses on similar themes were highlighted in same colours. Same colour responses were then grouped into categories. The process started with open coding generating many initial themes from the data. The total number of codes at

the initial stage was high to maintain a wide range of themes to choose from. Subsequently, similar codes were merged or grouped into higher or lower level themes (Table 1). All the interview responses associated with coded themes were examined to identify related and/or contrasting views, and to understand the factors or perceptions being expressed. Data descriptions and interpretations eventually followed within each major theme. The final list of codes is presented in Table 2 Themes 3 and 6 are, however, relevant to this paper).

The results focus on responses from water users who claimed largely to have good health or no health problems. It should be noted that the self supply well selection criteria used in the wider research located wells but did not pre-empt the gender, status of self supply well owner/user, or the health status of respondents. It was however important to retain the owner/user of sampled wells as research subjects for the purpose of triangulation. With this, interview results could be triangulated with findings from researcher's observation of the well handling and results from the quantitative sanitary inspections and water quality analysis conducted on sampled wells.

Study Area

Abeokuta is the capital city of Ogun State in south-western Nigeria. The city has about 250,000 people inhabiting some 50 heterogeneous townships. Abeokuta is located in the humid tropics with 7 – 8 months of bimodal peak rainy season and an average annual rainfall of 1, 200 mm. The urban city is covered by the crystalline Basement Complex consisting of igneous and metamorphic rocks. Groundwater occurrence in the area is limited to the fractured and in-situ weathered portion of the rocks (Martins *et al*., 2000). As at the year 2007, there were more than 2,000 self supply hand-dug wells across the city (Oluwasanya *et al*., 2011).

RESULTS AND DISCUSSION

Perception of health impact

The initial reaction of more than half (53%) of the 61 respondents to the question of sickness is denial. '*I have never been sick*', '*I do not fall sick*', or '*Never; sickness is not my portion*' are common responses (Table 2). While 26% denied diarrhoea diseases, 27% claimed that they do not fall sick at all or not often. The observed apparent general denial of sickness is in this paper referred to as denial syndrome or denial attitude to health.

TABLE 1: INTERVIEWS' CODING
Interview findings: Themes and sub-headings, explanatory remarks and relevant research objectives that the themes cover

	Theme headings and sub-headings	Remarks
1	Water uses	Examines actual water uses. It summarizes drinking water practices of users, the why and why not of drinking well water, and alternative drinking water. Highlight the number of users that drinks well water. Identifies user-defined uses, both suggesting a link with water quality perception. Many more discussion points, which ends with justification for water safety plans
2	Number of users	Estimates of users from interview results. Completes inventory data and may further support the need for WSP for SSS
3	Attitude to health impact	Examines the health angle to water safety. May suggest link to sources of contamination and possible hazards to water safety
4	Household water handling Water storage Household water treatment/attitude	Looks at existing practices at household that might be regarded as control measures to safe guard drinking water
5	Source management practices Source operations Management problems Source improvement & roles	Highlights various source management practices in terms of problems, challenges, source operation, and maintenance and source improvements. It also examines all identified roles and responsibilities around source management
6	Users' knowledge/awareness (to safety) Source safety Water safety Sources of contamination	Highlights what users know of water safety problems and what they do not know. It would be useful in identifying needed support programs
7	Users' willingness to intervention Actual intervention uptake	This theme put a spot light on the willingness of users to intervention uptake and distinguishing the actual uptake. It may help to suggest and prioritize intervention recommendations.
8	Government/PHD intervention Supporting programs	Identifies the role and responsibilities of government and agencies.

PHD: Public Health Department

Table 2: Users' attitude to sickness; N = 61

	In Denial		Admit to sickness	Total
	Diarrhoea	Been sick at all		
No. of responses	16	17	29	62*
%	26	27	47	100
%	53			

***Overlap in responses. One respondent is in denial of having diarrhoea and of being sick at all**

Factors influencing water users' attitude to health impact

The denial of water users to health impact is influenced by five factors (Figure 1). The factors are deduced from 38 (N^{I}) of 61 responses (N). The five factors are namely the degree of seriousness that users attach to disease/sickness (14 respondents or 36%), the time factor; interval between last sickness and current health status (9 respondents or 24%), users' religious belief (8 respondents or 21%), the sense of immunity to source water (4 respondents or 11%), and limited knowledge of particular diseases (3 respondents or 8%).

It is important to note that within the context of qualitative research, claiming that identified 'factor' is responsible for a percentage of particular variable, attribute or phenomenon – in this case 'denial attitude' - is not what qualitative analysis may confer or tell. While quantitative study involves collection of data in form of numbers, qualitative collects data in form of words and pictures (Neuman, 2003). However, to understand the factors or describe the perceptions that are being expressed by responders, it was reasonable to indicate the proportion of responses or number of responders who conveyed a similar point. It was also expedient to allocate higher level of influence to identified factors that were expressed by larger number of users. Consequently, the presented 'factors' within the context of the research suggest possible links to sources of contamination of self-supply systems (the object of study) and possible hazards to the safety of water from such sources. The highlighted factors and the denial attitude that they point to are also useful in identifying needed supporting programs within the context of water safety planning.

The five factors are discussed in turn.

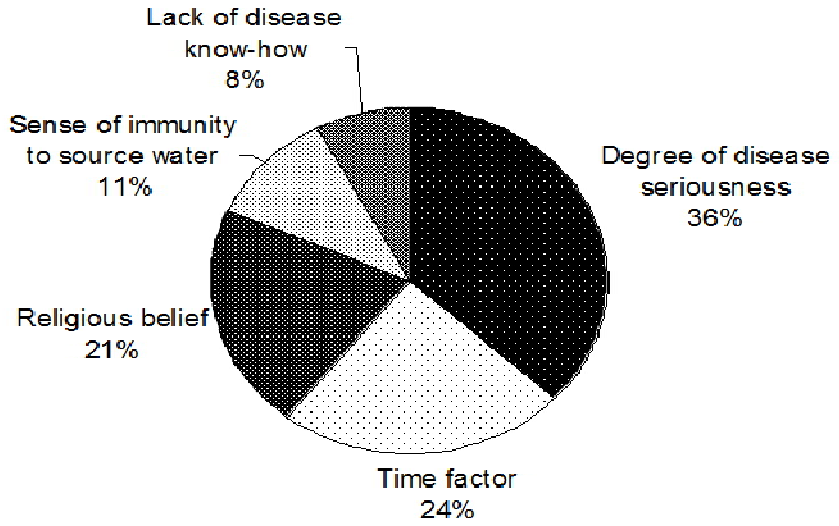

Figure 1: Factors influencing water users' attitude to health impact. N = 61; N^{I} = 38

Degree of disease seriousness

Thirty six percent of the responses indicated that water users' perception of the degree of disease seriousness may be linked to denial attitude (Figure 1). The degree of disease seriousness thus appears to be the most influencing factor on users' attitude to health impact. When sickness is perceived as minor, then users are not sick. When the illness is however considered serious, then that is sickness. Examples of minor illnesses are headache, cold and/or malaria, whilst typhoid, cholera or any diarrhea related diseases qualifies as serious sicknesses (Box 1).

Time factor

Time factor denotes the interval or length of time between date of last sickness and current health status. Twenty four percent of responders linked Time factor to denial syndrome (Figure 1). When the interval is considered long by users, then the user claims '*I do not get sick*'! A long time however means different time span to different users. Box 2 highlights various interpretations of 'long time' as explained by five of the nine respondents from whose answers the time factor was deduced. In Box 2 the length of time is a range from one year (last year) to 20 years (from top down)

Religious belief

Belief in God, the Supreme Being is highlighted by 21% of the responders (Figure 1). Religious belief is inter-related with perceived degree of seriousness of sickness. Users are quick to reject or ward off the occurrence of any disease that they perceived to be serious whenever the disease is mentioned or referred to. Warding off seems to make the disease go away or prevent the

sickness. It, however, appears that warding off the occurrence of serious diseases is not enough without the expression of faith or belief in the Supreme Being who is considered able to prevent the disease. The above presumption tied to the expression of faith or belief is evident in 8 of 38 responses (Box 3). Examples of such expression of faith include '*God forbid', '…Jesus is my Healer', '...we pray that such will never happen in our area',* and *'Thank God, I have never been to the hospital'* (Box 3)!

As shown in Box 3, warding off sicknesses by the expression of faith or belief does not imply that the user has not been sick or was never sick as claimed. Rather, sickness denial through the expression of faith or believe conveys two points. Firstly, that the Supreme Being who is believed, is able to and will prevent the occurrence of especially serious diseases (R1, R20, R46, R53, & R68), secondly, the Supreme Being sustains good health status (R78, R94, & R96).

I:	So no one here has had cholera before?
R_3:	Among us? Never
I:	The germs found in the water can cause cholera, diarrhoea, etc...What about dysentery?
R_3:	We would never see that here.
R_{27}:	I don't get sick
I:	You expect us to believe that you have never been ill?
R_{27}:	I've been sick but not recently…
I:	What was the illness?
R_{27}:	It was cold (flu)
I:	What do you do when you are sick?
R_{28}:	I really do not get sick, so I do not know how to answer that.
I:	You've never fallen sick before?
R_{28}:	No; may be slight headache, which comes and goes …I have not been seriously sick since I grew up
I:	What about your children?
$_8$:	No, not recently. They also don't fall sick
I:	When you are sick what do you do, I mean how do you treat yourself?
R_{73}:	I don't normally fall sick, except if I have malaria.
I:	Except malaria? Is malaria not a form of sickness?
R_{73}:	Not really, I have malaria when I have serious mosquito bites

Source: Research interviews; I = Interviewer; R: Respondents

Box 1: Sickness denial based on the degree of seriousness that water users' attach

R_{27}: I don't get sick
I: You expect us to believe that you have never been ill?
R_{27}: I've been sick but not recently :

I: How do you take care of yourself when sick?
R_{94}: I was last sick **2-3 years ago.**

I: Did any of your children have diarrhoea or cholera?
R_{50}: They never have it.
I: Is it that they never have it or it has been a long time since they had it?
R_{50}: It has been a long time, about **seven years ago.**

I: How do you treat yourself when sick?
R_{93}: I don't get sick, not even once in the last **10 years**!

I: If you are sick what do you do?
R_1 Never; I've never (been) sick
I: Never?
R_1: It is over **20 years**

Source: Research interviews; I: Interviewer; R: Respondent

Box 2: Time factor influence on denial attitude of water users to health impact

Perceived (Sense) of immunity to source water

Eleven percent or four of 38 respondents denied especially water borne diarrhea or related cholera disease (it should be noted that the presence of *E. coli* - a universally accepted indicator bacteria- suggests the likely presence of germs like *Vibrio cholerae*, which is responsible for cholera disease) by statements that literarily connote a sense of immunity to source water (Figure 1). Statements from the four responders may have more than one interpretation (Box 4). For instance *'…we use it (hand dug well water), drink and cook with it and nothing happened to us…'* may be interpreted in one of two ways. Firstly, 'if indeed cholera causing germ is in the water and I have not had cholera since using the water, then I am immune to cholera or the causing agent'. Secondly, 'if I have been using the source water for this long and I have not been infected with cholera, then cholera causing agent cannot be in the water'! Consequently three points can be deduced from the comments in Box 4: 'No water borne disease (diarrhea/ cholera) is suffered since the usage of the water source' (R23, R26, R55, & R71; all four respondents); 'Users are immune to disease-causing agents if indeed the agents are present in water as claimed' (R23; one out of four respondents); 'There are no disease-causing agents in the water as claimed' (R26, R55, & R71; three out of four respondents).

R_1: God will not allow such to happen, we will never see sickness.

I: Your water was tested and found to contain *E. coli*, a germ that can cause diarrhoea (or indicate the presence of the germ that can cause cholera).
R_{20}: **God forbid such in our area**.

I: Do you know if anyone here has had cholera before ……..
R_{46}: Mummy said **God has not allowed that to happen**.

R_{53}: No**; we don't pray for Cholera**, we don't have it around here

I: What about typhoid fever?
R_{68}: **No, that will not happen to us in Jesus name**. We never had that before
I: Not to you and the children?
R_{68}: **By the grace of God, no**
I: What about diarrheal?
R_{68}: Not my child

I: Ok, when did you go to hospital last?
R_{78}: **Thank God I have not been to the hospital**

R_{94}: I was last sick 2-3 years ago. It was normal fever and I use self medication. Presently however, I live on divine health. **''Divinely we are sustained''**!

I: How many times have you been sick in the last 6 months?
R_{96}: **None, Jesus is my healer**!

Source: Research interviews; I: Interviewer; R: Respondents

Box 3: Expression of faith or belief: influence of religious belief on denial of sickness

From the above deductions, all four respondents denied diarrhea or cholera disease. A statement from one (R23) of the four suggests immunity to disease causing agents and admits to link between disease-causing agents and water – *'…well it (the hand dug well) may contain it (E. coli) but there is no one here who has had cholera since I have been using the (hand dug) well'*. Three out of four respondents however gave the indication that there are no disease-causing agents in their waters – *'….this is the water we have been using…..and we have not been infected with cholera...'* The responses of the latter 75% of the users imply that there is the possibility that larger percentage of users may not be making the link between disease-causing agents and medium of disease transmission, which is water.

Lack of disease know-how

Water users' lack or limited knowledge of diseases is the fifth driver behind denial. This fifth factor is highlighted by 8% of responders (Figure 1). In the dialogue shown

in Box 5, two (R24 & R43) of the three respondents denied sickness in children *('… nothing is wrong with them…')* but admit that children has been teething. Generally in the study area, the term teething is not used to connote the expected or ideal teeth growing process/stage in a child rather the term is used to denote the sickness that is associated with teeth growing stage in infant. For instance, the dialogue in Box 6 explains what users mean by teething in children – frequent stool with temperature. The third respondent (R53) particularly denied diarrhea related sicknesses but admit to teething in children. From Box 6, teething in children is obviously not regarded as diarrhea or diarrhea related disease and consequently not related with water. Water users' description of teething in children is however similar to the description of diarrhea in medicine. In medicine, diarrhea is characterized by frequent loose or liquid bowel movements. By implication, teething in children is diarrhea. That water users do not understand or take teething in children to be diarrhea can be viewed as disease misrepresentation and an evidence of lack of disease know-how.

I:	It contains E. coli that causes cholera and diarrhoea….
R_{23}:	Well it may contain it but there is no one here who has had cholera since I have been using the well
I:	What do you think can cause such things since you are the user?
R_{26}:	We use it, drink and cook with it and nothing happened to us
I:	Since when have you been living here?
R_{26}:	1994
I:	And no one has had cholera?
R_{26}:	No
I:	But you also use it for dish washing?
R_{55}:	Yes even for bathing and it causes nothing.
R_{71}:	This is the water we have been using. It is the water that I drink and use. And I have never been affected by cholera or anything

Source: Research interviews; I: Interviewer; R: Respondent

Box 4: Respondents statements that suggest sense of immunity to source water

I:	Aunty what is wrong with your child?
R_{24}:	Nothing
I:	They said he is teething
R_{24}:	Yes
I:	What did you use for him?
R_{24}:	We took him to the hospital in Lantoro (The biggest private hospital in Abeokuta)
I:	Which drugs were they given?
R_{24}:	I don't know it
I:	Is it Bonababe?
R_{24}:	I don't know.
I:	Ok, what is wrong with your child?
R_{43}:	my child? Nothing, there is nothing wrong with him
I:	We heard that he is teething
R_{43}:	Yes
I:	What did you use for him?
R_{43}:	We took him to the hospital, Duro hospital; it's very close by
I:	Which drugs were you given?
R_{43}:	I don't know it
I:	Is it Bonababe?
R_{43}:	I don't know.
I:	Do they have dysentery?
R_{53}:	No; we don't pray for Cholera, we don't have it around here
I:	When your children are teething, what do you use for them?
R_{53}:	We use Bonababe (Brand name for a local teething medicine)

Source: Research interviews; I: Interviewer; R: Respondents

Box 5: Lack of disease (diarrhoea) know-how exhibited by water users

I:	Good day aunty
R_{37}:	Thank you
I:	Your child has stopped teething?
R_{37}:	Yes
I:	What was the problem he had?
R_{37}:	He had temperature and he was stooling (loose or watery excrement)
I:	When last was that?
R_{37}:	About 2 months ago
I:	Which drug did you use?
R_{37}:	Bonababe (brand name of teething medication)
I:	Who asked you to use the drug?
R_{37}:	It was advertised on the Television
I:	Is it not prescribed by a doctor?
R_{37}:	No
I:	Does the drug work after use?
R_{37}:	Yes
I:	Has it happened again?
R_{37}:	No
I:	How frequent was the stooling?
R_{37}:	Like twice in a day
I:	What type of water are you using for him?
R_{37}:	Tap water
I:	Did you add anything to the water?
R_{37}:	No
I:	Do you bath him with well water?
R_{37}:	No

Source: Research interview; I: Interviewer; R: Respondent

Box 6: Interview dialogue presenting water users description of teething in children

The role of God in water safety planning

Although the ability of the Supreme Being to prevent diseases and sustains good health is not in question, the points expressed in sickness denial through the expression of faith suggest an inherent danger. That is the danger of water users shifting part or all of the responsibility of disease prevention and health management to the Supreme Being. The implication of the identified danger is that water safety measures necessary to ensure water and invariably human health safety may be compromised by religious belief, and denial attitude to sicknesses that the belief fuels.

Water safety planning is expected to impact (prevent water borne or related diseases and improve health status) on health if adopted and implemented (WHO, 2004, 2011). Water safety plans thus represents the role of man in disease prevention. Water users may not however see the need to adopt source and household water safety plans to prevent sicknesses as there is a God who is deemed responsible for disease prevention and good health.

It would therefore be necessary to promote enlightenment programs to highlight or focus on water users' role in disease prevention. Acknowledge the ability of the Supreme Being in disease prevention but emphasize individuals' responsibility and role as well. It would also be important to involve religious leaders in enlightenment programs for participation and teaching on the role of God and man in disease prevention.

Disease misrepresentation/know-how and water safety intervention

The possibility that high percentage of users do not make the link between disease-causing agents and the medium of transmission, which is water, is noted in this paper. Similarly, teething in children is neither regarded as a diarrhea disease nor related with water. These findings signify further concerns for water safety planning.

It should be noted that 98% of diarrhoea is as a result of poor water, sanitation and hygiene. Diarrhoea is responsible for about 2 million child deaths per year (JMP, 2005; 2008; 2012). Food, faeces, flies, fingers, and water are notable faecal-oral routes of disease transmission (Percival *et al*, 2004). Three of the five noted routes have either a direct or indirect link with water. Ingestion of unsafe water represents a direct link, while food and fingers (through food/fruit, plate or hand washing for instance) represents indirect link with water.

The identified disease misrepresentation will cloud the link between water and water borne diseases like diarrhea. Disease mismatch will also preclude the importance of ensuring safety measures of sources by users, and invariably undermine the need for water safety plans. Clear understanding of water borne diseases, their causes, and transmission pathways/route is essential for water users. The understanding may facilitate or help users to see the need to take water safety measures to protect their water sources for improved health. Education on water borne or water related diseases, causes

and transmission pathways is thus worth including in enlightenment or water safety plans supporting programs.

CONCLUSION

It is apparent from the results obtained that the perception of water users in relation to health impact is important. Users' perception of health impact can undermine the adoption and implementation of water safety plans. Disease misrepresentation and lack of disease know-how by users are clear indications of how adoption of water safety plans can be marred. Religious belief that masks the role of man in disease prevention is another example of how the adoption of water safety plans may be compromised. Denial of health impact by users translates to denying the need for water safety plans.

Water safety plans represent the role of man in disease prevention and health sustainability. Water safety plans are expected to impact on health if adopted and implemented. To impact on health, facilitating water safety plans would require clear understanding of users' perceptions of health impact and the factors that may be influencing those perceptions.

Besides training users on the basic knowledge and skills surrounding water safety plans of their sources, some of the action points for water safety plans facilitators would include among others:

Understand users' perceptions of health impact. Denial attitude to health impact is denying the need for water safety plans;

Address the factors affecting attitude of users to health impact through initial supporting programs;

Identify key stakeholders to involve in initial supporting programs. Examples of key stakeholders include religious leaders, public health educators, and/or health practitioners.

Initial supporting programs should include enlightenment and education on the following: role of God and man in disease prevention; water borne/related diseases, causes and route of transmission; best practice in disease treatment; and identification of regulated medical prescription sources.

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